

Specification of Automotive MLCC

- Supplier : Samsung electro-mechanics
- Product : Multi-layer Ceramic Capacitor

- Samsung P/N : **CL21B472KC65PNC**
- Description : **CAP, 4.7nF, 100V, ±10%, X7R, 0805**
- AEC-Q 200 Specified

A. Samsung Part Number

CL 21 B 472 K C 6 5 P N C
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

①	Series	Samsung Multi-layer Ceramic Capacitor				
②	Size	0805 (inch code)	L:	2.0 ± 0.1 mm	W:	1.25 ± 0.1 mm
③	Dielectric	X7R	⑧	Inner electrode	Ni , Open mode	
④	Capacitance	4.7 nF		Termination	Cu , Ag-epoxy	
⑤	Capacitance tolerance	±10 %		Plating	Sn 100% (Pb Free)	
⑥	Rated Voltage	100 V	⑨	Product	Automotive	
⑦	Thickness	0.6 ± 0.1 mm	⑩	Grade code	Standard	
			⑪	Packaging	Cardboard Type, 7" reel	

B. Reliability Test and Judgement condition

	Performance	Test condition
High Temperature Exposure	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ : 0.03 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller	Unpowered, 1000hrs@T=150℃ Measurement at 24±2hrs after test conclusion
Temperature Cycling	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ : 0.03 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller	1000Cycles Measurement at 24±2hrs after test conclusion 1 cycle condition : -55+0/-3℃(15±3min) -> Room Temp(1min.) -> 125+3/-0℃(15±3min) -> Room Temp(1min.)
Destructive Physical Analysis	No Defects or abnormalities	Per EIA 469
Moisture Resistance	Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.03 max IR : More than 10,000MΩ or 500MΩ×μF Whichever is Smaller	10Cycles, t=24hrs/cycle Heat (25~65℃) and humidity (80~98%), Unpowered measurement at 24±2hrs after test conclusion
Humidity Bias	Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.035 max IR : More than 500MΩ or 25MΩ×μF Whichever is Smaller	1000hrs 85℃/85%RH, Rated Voltate and 1.3~1.5V, Add 100kohm resistor Measurement at 24±2hrs after test conclusion The charge/discharge current is less than 50mA.
High Temperature Operating Life	Appearance : No abnormal exterior appearance Capacitance Change : Within ±12.5% Tan δ : 0.035 max IR : More than 1000MΩ or 50MΩ×μF Whichever is Smaller	1000hrs @ TA=125℃, 200% Rated Voltage, Measurement at 24±2hrs after test conclusion The charge/discharge current is less than 50mA.

	Performance	Test condition											
External Visual	No abnormal exterior appearance	Microscope (×10)											
Physical Dimensions	Within the specified dimensions	Using The calipers											
Mechanical Shock	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks) <table><tr><td>Peakvalue</td><td>Duration</td><td>Wave</td><td>Velocity</td></tr><tr><td>1,500G</td><td>0.5ms</td><td>Half sine</td><td>4.7m/sec.</td></tr></table>				Peakvalue	Duration	Wave	Velocity	1,500G	0.5ms	Half sine	4.7m/sec.
Peakvalue	Duration	Wave	Velocity										
1,500G	0.5ms	Half sine	4.7m/sec.										
Vibration	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	5g's for 20min., 12cycles each of 3 orientations, Use 8"×5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000Hz.											
Resistance to Solder Heat	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	Solder pot : 260±5℃, 10±1sec.											
Thermal Shock	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	-55℃/+125℃. Note: Number of cycles required-300, Maximum transfer time-20 sec, Dwell time-15min. Air-Air											
ESD	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10% Tan δ, IR : initial spec.	AEC-Q200-002											
Solderability	95% of the terminations is to be soldered evenly and continuously	a) Preheat at 155℃ for 4 hours, Immerse in solder for 5s at 245±5℃ b) Steam aging for 8 hours, Immerse in solder for 5s at 245±5℃ c) Steam aging for 8 hours, Immerse in solder for 120s at 260±5℃ solder : a solution ethanol and rosin											
Electrical Characterization	Capacitance : Within specified tolerance Tan δ (DF) : 0.025 max. IR(25℃) : More than 10,000MΩ or 500MΩ×μF IR(125℃) : More than1,000MΩ or 10MΩ×μF Whichever is Smaller Dielectric Strength	The Capacitance /D.F. should be measured at 25℃, 1kHz±10%, 1.0±0.2Vrms I.R. should be measured with a DC voltage not exceeding Rated Voltage @25℃, @125℃ for 60~120 sec. Dielectric Strength : 250% of the rated voltage for 1~5 seconds											
Board Flex	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10%	Bending to the limit (2mm) for 5 seconds											
Terminal Strength(SMD)	Appearance : No abnormal exterior appearance Capacitance Change : Within ±10%	18N, for 60±1 sec.											
Beam Load	Destruction value should not be exceed Chip Length < 2.5mm a) Chip Thickness > 0.5mm : 20N b) Chip Thickness ≤ 0.5mm : 8N	Beam speed 0.5±0.05mm/sec											
Temperature Characterisitcs	X7R (From -55℃ to 125℃, Capacitance change should be within ±15%)												

C. Recommended Soldering method :

Reflow (Reflow Peak Temperature : $260 \pm 0/-5^{\circ}\text{C}$, 10sec. Max)

Meet IPC/JEDEC J-STD-020 D Standard

* For the more detail Specification, Please refer to the Samsung MLCC catalogue.